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THE USE OF RED MUD FOR BRICK COLORING

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It is found that the introduction of red mud (up to 5%) and ferric oxide pigment (up to 8%) makes it possible to improve the color of brick, increase its strength, and reduce water absorption. Besides, pigment additives can be used for decorative pinkish-lilac coloring of the surface layer of ferroconcrete wall panels.

Iron oxide clays, industrial wastes from concentration of iron ores, etc. [1], i.e., compounds containing iron oxides, can be used as brick pigments.

Considering that the brick produced at OAO BAZ Brick Factory (town of Krasnotur'insk) has heterogeneous coloration even within the same batch, we investigated the effect of addition of alumina waste and the ferroxide pigment synthesized on its basis on the color and physicomachanical properties of the brick.

The possibility of using red mud as an inorganic pigment is determined by its composition (the content of iron(III) oxide is 45%). Red mud is a large-tonnage waste in alumina production at the OAO BAZ company. Its application in various branches of industry helps to solve environmental problems. The iron oxide pigment based on red mud was obtained according to the technology described in RF Patent No 2047631. The content of iron(III) oxide in it increases to 52%. The chemical composition of the OAO BAZ waste mud averaged over the year is presented in Table 1.

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TABLE 1

Mud	Content, wt. %							loss after calcination
	Al ₂ O ₃	SiO ₂	Fe ₂ O ₃	CaO	TiO ₂	Na ₂ O	other	
Waste mud	13.3	7.1	46.5	12.9	4.2	2.5	7.7	6.3
Mixture of Baier and sintering mud	14.0	9.4	42.2	12.1	3.9	4.1	8.6	5.7

TABLE 2

Material	Content, wt. %						loss after calcination
	SiO ₂	Al ₂ O ₃	TiO ₂	Fe ₂ O ₃	CaO	Na ₂ O + K ₂ O	
Clay	64.20	15.30	0.98	8.00	3.69	3.51	6.80
Argillite	41.50	20.57	0.98	18.17	3.56	1.73	13.77
Sand	88.60	2.59	–	1.23	0.50	0.86	–

The initial charge used for the investigation contained: 60% argillite from the Volchanskii deposit, 20% clay from the Brusnichnyi deposit, and 20% sand from the Kamenskii deposit. The chemical composition of the material is indicated in Table 2.

The initial material was used to make several bars of size 9 × 2 × 1.2 cm with and without the additives of red mud and pigment to the extent of 0.5–8%. Continuous coloring was applied. The bars were fired at 950–1000°C. After that the physicomachanical properties (shrinkage, water absorption, strength) were determined by standard methods.

The data obtained are represented in Fig. 1–4. The analysis of the data in Figures 1 and 2 indicates that addition of red mud and iron oxide pigment produces an increase in the shrinkage of the samples. The pigment introduced to the extent of up to 4% affects the shrinkage level more significantly than the red mud. This regularity is disturbed in the case of introducing 8% additives. In this case, the shrinkage of the sample with the red mud reaches its peak value (2%). With an increase in the firing temperature from 950 to 1000°C, the shrinkage of all samples increases regularly.

With a rise in the firing temperature and increase in the additive content, the water absorption of the samples containing red mud (up to 5%) and iron oxide pigment (up to 8%) decreases. The addition of 8% red mud causes an increase in water absorption.

Upon introduction of up to 5% red mud and up to 8% pigment, the strength of the samples increases (Figures 3 and 4). As the firing temperature increases, the strength decreases slightly.

The color of the samples improves with the additives. The samples acquire a homogeneous color.

In addition, the experiments on the decorative coloring of the surface

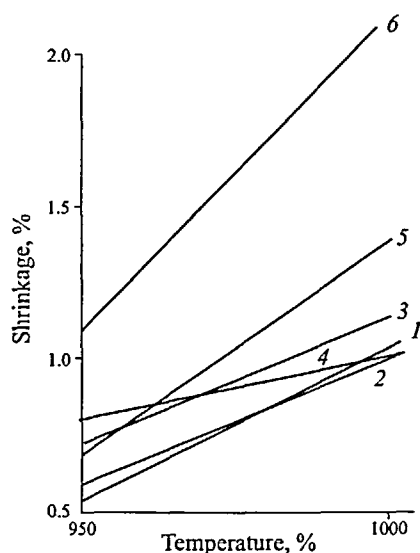


Fig. 1. Dependence of the shrinkage of samples on the firing temperature and the amount of red mud: 1) standard sample; 2, 3, 4, 5, and 6) are samples containing 0.5, 1.0, 2.0, 4.0, and 8.0% red mud, respectively.

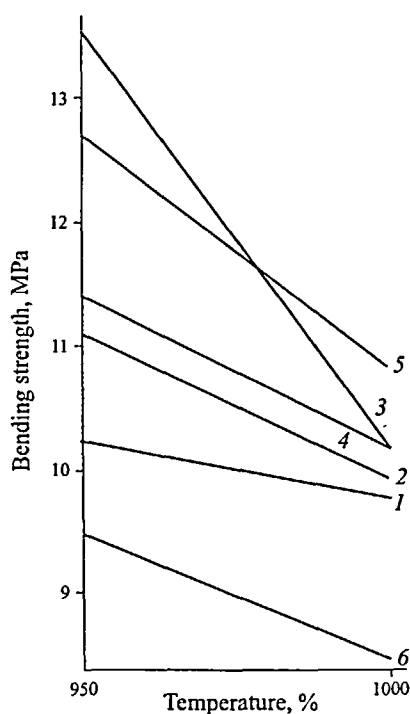


Fig. 3. Dependence of the strength of the samples on the firing temperature and the amount of red mud: 1) standard sample; 2, 3, 4, 5, and 6) are samples containing 0.5, 1.0, 2.0, 4.0, and 8.0% red mud, respectively.

layer of large blocks (series 113-81) with PZh-A pigment (TU 2253-149-00194091-91) obtained from red mud (RF patent 2047631) and used as a filler for the brick were carried out. It was found that the introduction of 15–20% pig-

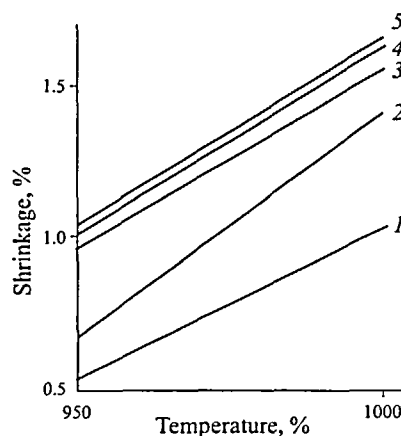


Fig. 2. Dependence of the shrinkage of samples on the firing temperature and the amount of pigment: 1) standard sample; 2, 3, 4, and 5) are samples containing 1, 2, 4, and 8% pigment, respectively.

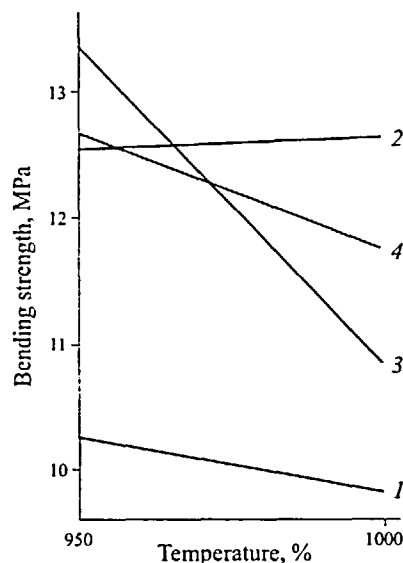


Fig. 4. Dependence of the strength of the samples on the firing temperature and amount of pigment: 1) standard sample; 2, 3, 4, and 5)

ment imparts a pinkish-lilac color to the outside layer of the wall panels.

Thus, the introduction of red mud (up to 5%) and iron oxide pigment (up to 8%) makes it possible to improve the color of the brick, enhances its strength and decreases water absorption. Moreover, the pigment additives can be recommended for decorative coloring of the surface layer of ferro-concrete wall panels a pinkish-lilac color. Such panels are used in housing construction in Krasnotur'insk.

REFERENCES

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